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TITLE	8K PAL-D ASSEMBLER FOR 4K DISK MONITOR SYSTEM
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SOURCE LANGUAGE	PAL-D

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8K PAL-D ASSEMBLER FOR 4K DISK MONITOR SYSTEM

DECUS Program Library Write-up

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The 8K PAL-D Assembler differs from the 4K PAL-D Assembler as specified in the 1970 Programming Language Manual except as follows:

1) Input may be from any of the following:

*IN -	T:	Teletype reader
	R:	High-speed reader
	S: name	DF-32 disk or DECtape
	Sn: name	RF-08 disk
	Dn: name	DECtape

2) Binary output may be to:

*OUT -	T:	Teletype punch
	R:	High-speed punch
	S: name	DF-32 disk or DECtape
	Sn: name	RF-08 disk
	Dn: name	DECtape (On DECtape Systems only)

3) Listing output may be to:

*OPT -	T	Teletype
	R	High-speed punch
	L	LP-08 Line printer

The 8K PAL-D Assembler has the following pseudo-ops:

- DECIMAL
- * EJECT
- * ENPUNCH
- EXPUNGE
- FIELD
- FIXTAB
- * IFDEF
- * IFZERO
- * NOPUNCH
- OCTAL
- PAGE
- PAUSE
- TEXT
- XLIST
- * ZBLOCK

*Pseudo-ops not found in 4K PAL-D but explained in the 1970 Programming Language Manual.

8K PAL-D provides space in the Symbol table for approximately 890 User defined symbols. It may be saved on the system device with the following command: .SAVE PAL8!0-5177, 6600-7577;200

8K PAL-D PROGRAMMING

The 8K PAL-D Assembler is similar to 4K PAL-D. The reader is advised to learn the 4K PAL-D Assembler by studying the appropriate sections of Chapter 13 of the Programming Language Manual, then return to this section to learn the additional features of 8K PAL-D. These additional features include assembler directives which permit operation of the Assembler to be controlled by the source program, page control, and the ability to expand to run in 12K of core.

CHARACTER SET

In addition to the characters allowed in 4K PAL-D, the following characters are given a special significance in 8K PAL-D: < >.

The angle brackets (< >) define the bounds of a conditional statement. The user should be especially cautious not to use angle brackets within a comment in any program containing a conditional assembly statement.

PSEUDO-OPERATORS

In addition to the pseudo-operators allowed in 4K PAL-D, the following pseudo-operators are unique to 8K PAL-D:

RESERVING FREE STORAGE

ZBLOCK n

Where n is an integer, ZBLOCK causes the Assembler to reserve n words of memory containing zeros, starting at the word indicated by the current location counter.

CONDITIONAL ASSEMBLY

IFDEF symbol <statements>

If the symbol indicated is previously defined, assemble the statements contained in the angle brackets. If undefined, ignore these statements. Any number of statements can be contained in the angle brackets and may consist of several lines of code. The format of the IFDEF statement requires a single space before and after the symbol.

IFZERO expression <statements>

If the evaluated (arithmetic or logical) expression is equal to zero, assemble the statements contained within the angle brackets; if the expression is non-zero, ignore these statements. Any number of statements can be contained in the angle brackets and may consist of several lines of code. The format of the IFZERO statement requires that the expression not contain any imbedded spaces and must have a single space preceding and following it.

BINARY OUTPUT CONTROL

NOPUNCH

Upon encountering this statement the Assembler continues to assemble the code, but ceases binary output.

ENPUNCH

This statement causes the Assembler to resume (or continue) binary output.

These two pseudo-operators are put into the source program and are ignored until pass 2 at which time they direct the Assembler to delete some section of code from the final binary punched tape.

For example, these pseudo-operators could be used where several programs have the same contents on page zero. When these programs are to be loaded and executed together, only one page zero need be punched.

PAGINATION OF OUTPUT LISTINGS

EJECT

The EJECT command causes the listing to jump to the top of the next page. The 8K PAL-D Assembler counts output lines and will format the user's program into neat, even pages with a page eject every 55 lines. If the user requires more frequent paging, he should use the EJECT pseudo-operator. A FORM FEED character within the source program will also cause a page eject.

The pagination process within the 8K PAL-D Assembler causes an output of carriage return/line feed pairs for the 33 ASR Teletype. For users with the 35 ASR Teletype who desire to output a FORM FEED character directly, changes should be made to modify the FORMI subroutine found in the 8K PAL-D listing.

LOADING AND OPERATING PROCEDURES

Saving 8K PAL-D

The 8K PAL-D Assembler is supplied on binary coded paper tape. It is loaded using the Binary Loader as explained in Appendix C2.

The 8K PAL-D Assembler may be saved on the system device as a system program. This is done by typing the following SAVE instruction:

```
.SAVE PAL8: 0-5177,6600-7577;200
```

The Assembler is now saved as a system program. The programmer may now type PAL8, which brings the assembler into core for use with symbolic source programs.

Output devices are the same for 8K PAL-D as for 4K PAL-D. When 8K PAL-D requests the input file(s), the user may select up to ten (10) input files. Valid input devices for 8K PAL-D are as follows:

Device DesignatorDevice

T:	Teletype
R:	High-speed reader/punch
S: name	DF 32 disk
Sn: name	RF 08 disk
DO: name through D7: name	DECtape

Symbol Table

The symbol table for 8K PAL-D provides space for approximately 890 (decimal) user defined symbols. When the SE (symbol table exceeded) error message occurs, assembly is terminated and control is returned to the Monitor. The user file .SYM is not used by 8K PAL-D.

12K VERSION OF 8K PAL-D

The 8K PAL-D Assembler must be reassembled to run in 12K of core. The 12K version has a larger symbol table, but assembles at a slower pace. The changes to be made are documented on page 1 of the 8K PAL-D listing.